

Q96763US.APP
SEQUENCE LISTING

<110> HAYASHI, HIROAKI
INOUE, KENICHIRO
HOSHINO, MASATERU
SHIBUYA, MASAOKI
EBIZUKA, YUTAKA

<120> TRITERPENE HYDROXYLASE

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<140> 10/590,661
<141> 2006-08-25

<150> PCT/JP05/03205
<151> 2005-02-25

<150> JP 2004-049123
<151> 2004-02-25

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<170> PatentIn version 3.3

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 <400> 8

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1 5	10 15	
tca acc att ctg ata cgt tcc atc ttc aag aaa cca cag cgt cta aga		96
Ser Thr Ile Leu Ile Arg Ser Ile Phe Lys Lys Pro Gln Arg Leu Arg	20 25 30	
ctc cca ccg ggt cct cca att tca gta ccc ttg ctg gga cac gcg cca		144
Leu Pro Pro Gly Pro Pro Ile Ser Val Pro Leu Leu Gly His Ala Pro	35 40 45	
tat ctc cgt tca ctg ctc cac caa gcc ttg tac aag cta tca ctg cgc		192
Tyr Leu 50 Arg Ser Leu Leu His 55 Gln Ala Leu Tyr 60 Leu Ser Leu Arg	50 55 60	
tat gga ccc ttg atc cac gtc atg atc ggt tcg aag cac gtg gtg gtg		240
Tyr Gly Pro Leu Ile His 70 Val Met Ile Gly Ser 75 Lys His Val Val Val 80	65 70 75 80	
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Ala Ser Ser Ala Glu Thr Ala Lys Gln Ile Leu Lys Thr Ser Glu Glu	85 90 95	
gca ttc tgc aac cgt ccc tta atg ata gcg agc gag agc cta acc tac		336
Ala Phe Cys Asn 100 Arg Pro Leu Met Ile Ala Ser Glu Ser Leu Thr Tyr	100 105 110	
ggc gcg gcg gac tac ttc ttc atc ccc tac ggc aca tac tgg cgg ttc		384
Gly Ala Ala Asp Tyr Phe Phe Ile 120 Pro Tyr Gly Thr Tyr Trp Arg Phe	115 120 125	
ctg aag aag ctc tgc atg acg gag ctt ctg agc ggg aag acc ctg gag		432
Leu Lys Lys Leu Cys Met Thr Glu Leu Leu Ser Gly Lys Thr Leu Glu	130 135 140	
cat ttc gtg aga atc cgc gag agc gag gtg gag gcg ttc ctc aag aga		480
His Phe Val Arg Ile Arg Glu Ser Glu Val Glu Ala Phe Leu Lys Arg	145 150 155 160	
atg atg gag att tca ggc aat gga aat tac gag gtg gtg atg agg aag		528
Met Met Glu Ile Ser Gly Asn Gly Asn Tyr 170 Glu Val Val Met Arg Lys	165 170 175	
gag ctc ata acg cac acg aat aac atc atc acg agg atg ata atg ggg		576
Glu Leu Ile Thr His Thr Asn Asn Ile Ile Thr Arg Met Ile Met Gly	180 185 190	
aag aag agt aat gcg gaa aac gat gag gtg gcc agg ttg agg aag gtg		624
Lys Lys Ser Asn Ala Glu Asn Asp 200 Glu Val Ala Arg Leu Arg Lys Val	195 200 205	
gtg agg gag gtc ggg gag ttg ctt ggg gcg ttt aac ttg ggg gat gtt		672
Val Arg Glu Val Gly Glu Leu Leu Gly Ala Phe Asn 220 Leu Gly Asp Val	210 215 220	
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Ile Gly Phe Met Arg Pro Leu Asp Leu Gln Gly 235 Phe Gly Lys Lys Asn	225 230 235 240	
atg gaa act cac cac aag gtg gat gcg atg atg gag aag gtg ttg agg		768
Met Glu Thr His 245 Lys Val Asp Ala Met Met Glu Lys Val Leu Arg	245 250 255	

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aag Lys	gat Asp	ctt Leu 275	ttt Phe	gat Asp	att Ile	ttg Leu	ttg Leu 280	aac Asn	ctc Leu	att Ile	gaa Glu 285	gct Ala	gat Asp	ggt Gly	gct Ala	864
gac Asp	aat Asn 290	aag Lys	ctc Leu	act Thr	aga Arg	gag Glu 295	agt Ser	gcc Ala	aaa Lys	gcc Ala	ttt Phe 300	gct Ala	ctg Leu	gac Asp	atg Met	912
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gac Asp	gtg Val	agg Arg 435	ggg Gly	cag Gln	tac Tyr	tat Tyr	cag Gln 440	ctc Leu	ctg Leu	ccc Pro	ttt Phe	ggg Gly 445	agc Ser	ggg Gly	aga Arg	1344
aga Arg	agc Ser	tgc Cys 450	ccc Pro	gga Gly	gcc Ala	tgc Ser 455	cta Leu	gcg Ala	ttg Leu	ctt Leu	gtc Val 460	atg Met	caa Gln	gca Ala	acg Thr	1392
cta Leu 465	gcg Ala	agt Ser	ttg Leu	atc Ile	cag Gln 470	tgc Cys	ttc Phe	gac Asp	tgg Trp	atc Ile 475	gtt Val	aat Asn	gat Asp	ggt Gly	aaa Lys 480	1440
aac Asn	cat His	cat His	gtt Val	gac Asp 485	atg Met	tct Ser	gag Glu	gaa Glu	ggg Gly 490	agg Arg	gtg Val	act Thr	gtg Val	ttt Phe 495	ttg Leu	1488
gcc Ala	aag Lys	cca Pro	ctc Leu	aag Lys	tgc Cys	aag Lys	cct Pro	gtt Val	ccg Pro	cgt Arg	ttc Phe	act Thr	ccg Pro	ttc Phe	gct Ala	1536

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505

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510

1542

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35 40 45Tyr Leu Arg Ser Leu Leu His Gln Ala Leu Tyr Lys Leu Ser Leu Arg
50 55 60Tyr Gly Pro Leu Ile His Val Met Ile Gly Ser Lys His Val Val Val
65 70 75 80Ala Ser Ser Ala Glu Thr Ala Lys Gln Ile Leu Lys Thr Ser Glu Glu
85 90 95Ala Phe Cys Asn Arg Pro Leu Met Ile Ala Ser Glu Ser Leu Thr Tyr
100 105 110Gly Ala Ala Asp Tyr Phe Phe Ile Pro Tyr Gly Thr Tyr Trp Arg Phe
115 120 125Leu Lys Lys Leu Cys Met Thr Glu Leu Leu Ser Gly Lys Thr Leu Glu
130 135 140His Phe Val Arg Ile Arg Glu Ser Glu Val Glu Ala Phe Leu Lys Arg
145 150 155 160Met Met Glu Ile Ser Gly Asn Gly Asn Tyr Glu Val Val Met Arg Lys
165 170 175Glu Leu Ile Thr His Thr Asn Asn Ile Ile Thr Arg Met Ile Met Gly
180 185 190Lys Lys Ser Asn Ala Glu Asn Asp Glu Val Ala Arg Leu Arg Lys Val
195 200 205

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Val Arg Glu Val Gly Glu Leu Leu Gly Ala Phe Asn Leu Gly Asp Val
 210 215 220

Ile Gly Phe Met Arg Pro Leu Asp Leu Gln Gly Phe Gly Lys Lys Asn
 225 230 235 240

Met Glu Thr His His Lys Val Asp Ala Met Met Glu Lys Val Leu Arg
 245 250 255

Glu His Glu Glu Ala Arg Ala Lys Glu Asp Ala Asp Ser Asp Arg Lys
 260 265 270

Lys Asp Leu Phe Asp Ile Leu Leu Asn Leu Ile Glu Ala Asp Gly Ala
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Asp Asn Lys Leu Thr Arg Glu Ser Ala Lys Ala Phe Ala Leu Asp Met
 290 295 300

Phe Ile Ala Gly Thr Asn Gly Pro Ala Ser Val Leu Glu Trp Ser Leu
 305 310 315 320

Ala Glu Leu Val Arg Asn Pro His Val Phe Lys Lys Ala Arg Glu Glu
 325 330 335

Ile Glu Ser Val Val Gly Lys Glu Arg Leu Val Lys Glu Ser Asp Ile
 340 345 350

Pro Asn Leu Pro Tyr Leu Gln Ala Leu Leu Lys Glu Thr Leu Arg Leu
 355 360 365

His Pro Pro Thr Pro Ile Phe Ala Arg Glu Ala Met Arg Thr Cys Gln
 370 375 380

Val Glu Gly Tyr Asp Ile Pro Glu Asn Ser Thr Ile Leu Ile Ser Thr
 385 390 395 400

Trp Ala Ile Gly Arg Asp Pro Asn Tyr Trp Asp Asp Ala Leu Glu Tyr
 405 410 415

Lys Pro Glu Arg Phe Leu Phe Ser Asp Asp Pro Gly Lys Ser Lys Ile
 420 425 430

Asp Val Arg Gly Gln Tyr Tyr Gln Leu Leu Pro Phe Gly Ser Gly Arg
 435 440 445

Arg Ser Cys Pro Gly Ala Ser Leu Ala Leu Leu Val Met Gln Ala Thr

450

455

Leu Ala Ser Leu Ile Gln Cys Phe Asp Trp Ile Val Asn Asp Gly Lys
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Ser Thr Ile Leu Ile Arg Ser Ile Phe Lys Lys Pro Gln Arg Leu Arg
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Leu Pro Pro Gly Pro Pro Ile Ser Ile Pro Leu Leu Gly His Ala Pro
35 40 45
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Tyr Leu Arg Ser Leu Leu His Gln Ala Leu Tyr Lys Leu Ser Leu Arg
50 55 60
tat gga ccc ttg atc cac gtc atg atc ggt tcg aag cac gtg gtg gtg 240
Tyr Gly Pro Leu Ile His Val Met Ile Gly Ser Lys His Val Val Val
65 70 75 80
gcg tcg tcg gcg gag acg gcc aag cag atc ctc aaa acc tcg gag gag 288
Ala Ser Ser Ala Glu Thr Ala Lys Gln Ile Leu Lys Thr Ser Glu Glu
85 90 95
gca ttc tgc aac cgt ccc tta atg ata gcg agc gag agc cta acc tac 336
Ala Phe Cys Asn Arg Pro Leu Met Ile Ala Ser Glu Ser Leu Thr Tyr
100 105 110
ggc gcg gcg gac tac ttc ttc atc ccc tac ggc aca tac tgg cgg ttc 384
Gly Ala Ala Asp Tyr Phe Phe Ile Pro Tyr Gly Thr Tyr Trp Arg Phe
115 120 125
ctg aag aag ctc tgc atg acg gag ctt ctg agc ggg aag acc ctg gag 432
Leu Lys Lys Leu Cys Met Thr Glu Leu Leu Ser Gly Lys Thr Leu Glu
Page 7

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gag ctc ata acg cac acg aat aac atc atc acg agg atg ata atg ggg Glu Leu Ile Thr 180 His Thr Asn Asn Ile 185 Ile Thr Arg Met Ile Met Gly 190			576
aag aag agt aat gcg gaa aac gat gag gtg gcc agg ttg agg aag gtg Lys Lys Ser 195 Asn Ala Glu Asn Asp 200 Glu Val Ala Arg 205 Leu Arg Lys Val			624
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ccc aac cta cca tac cta caa gca gtg ctg aag gaa acc cta agg ctg Pro Asn 355 Leu Pro Tyr Leu Gln Ala Val Leu Lys Glu Thr Leu Arg Leu 360 365			1104
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 Lys Pro Glu Arg Phe Leu Phe Ser Asp Pro Gly Lys Ser Lys Ile
 420 425 430 1296

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 Asp Val Arg Gly Gln Tyr Tyr Gln Leu Leu Pro Phe Gly Ser Gly Arg
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 Asn His His Val Asp Met Ser Glu Glu Gly Arg Val Thr Val Phe Leu
 485 490 495 1488

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 Ala 1542

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Ser Thr Ile Leu Ile Arg Ser Ile Phe Lys Lys Pro Gln Arg Leu Arg
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Leu Pro Pro Gly Pro Pro Ile Ser Ile Pro Leu Leu Gly His Ala Pro
 35 40 45

Tyr Leu Arg Ser Leu Leu His Gln Ala Leu Tyr Lys Leu Ser Leu Arg
 50 55 60

Tyr Gly Pro Leu Ile His Val Met Ile Gly Ser Lys His Val Val Val
 65 70 75 80

Ala Ser Ser Ala Glu Thr Ala Lys Gln Ile Leu Lys Thr Ser Glu Glu
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Ala Phe Cys Asn Arg Pro Leu Met Ile Ala Ser Glu Ser Leu Thr Tyr
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 Gly Ala Ala Asp Tyr Phe Phe Ile Pro Tyr Gly Thr Tyr Trp Arg Phe
 115 120 125
 Leu Lys Lys Leu Cys Met Thr Glu Leu Leu Ser Gly Lys Thr Leu Glu
 130 135 140
 His Phe Val Arg Ile Arg Glu Ser Glu Val Glu Ala Phe Leu Lys Arg
 145 150 155 160
 Met Met Glu Ile Ser Gly Asn Gly Asn Tyr Glu Val Val Met Arg Lys
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 Glu Leu Ile Thr His Thr Asn Asn Ile Ile Thr Arg Met Ile Met Gly
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 Lys Lys Ser Asn Ala Glu Asn Asp Glu Val Ala Arg Leu Arg Lys Val
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 Val Arg Glu Val Gly Glu Leu Leu Gly Ala Phe Asn Leu Gly Asp Val
 210 215 220
 Ile Gly Phe Met Arg Pro Leu Asp Leu Gln Gly Phe Gly Lys Lys Asn
 225 230 235 240
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 245 250 255
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 260 265 270
 Lys Asp Leu Phe Asp Ile Leu Leu Asn Leu Ile Glu Ala Asp Gly Ala
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 Asp Asn Lys Leu Thr Arg Glu Ser Ala Lys Ala Phe Ala Leu Asp Met
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 Ala Glu Leu Val Arg Asn Pro His Val Phe Lys Lys Ala Arg Glu Glu
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 Leu Val Lys Glu Ser Asp Ile
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Pro Asn Leu Pro Tyr Leu Gln Ala Val Leu Lys Glu Thr Leu Arg Leu
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 370 375 380

Val Glu Gly Tyr Asp Ile Pro Glu Asn Ser Thr Ile Leu Ile Ser Thr
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Lys Pro Glu Arg Phe Leu Phe Ser Asp Asp Pro Gly Lys Ser Lys Ile
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 500 505 510

Ala